Claims

What is claimed is:

1. A vector comprising a plurality of expression cassettes, wherein said plurality of expression cassettes comprise:

(a) at least one gene promoting cassette comprising a first polynucleotide operably linked to a first promoter sequence; and

(b) at least one gene suppressing cassette comprising a second polynucleotide operably-linked to a second promoter sequence, wherein said second polynucleotide encodes a short interfering RNA (siRNA) molecule that reduces expression of a target gene by RNA interference.

2. The vector of claim 1, wherein said siRNA molecule is an RNA duplex comprising a sense region and an antisense region, wherein said antisense region comprises a plurality of contiguous nucleotides that are complementary to a messenger RNA sequence encoded by said target gene.

3. The vector of claims 1 or 2, wherein said siRNA molecule is in the range of about 45 to about 60 nucleotides in length.

4. The vector of any of claims 1 to 3, wherein said at least one gene suppressing cassette comprises 410 nucleotides.

5. The vector of any of claims 2 to 4, wherein said sense region and said antisense region are covalently connected via a linker molecule.

6. The vector of any of claims 2 to 5, wherein said sense region and said antisense region of said RNA duplex contain one or more mismatches such that a bulge or hairpin structure is formed.

7. The vector of any of claims 1 to 6, wherein the vector comprises a plurality of said gene promoting cassettes.

8. The vector of any of claims 1 to 7, wherein said vector comprises a plurality of said gene suppressing cassettes.

9. The vector of any of claims 1 to 8, wherein said vector comprises three of said gene suppressing cassettes, and wherein each of said gene suppressing cassettes comprises 410 nucleotides.

10. The vector of any of claims 1 to 9, wherein said first promoter sequence, or said second promoter sequence, or both said first and second promoter sequences are inducible.

11. The vector of any of claims 1 to 10, wherein said first promoter sequence, or said second promoter sequence, or both said first and second promoter sequences are tissue-specific.

12. The vector of any of claims 1 to 11, wherein said vector is a non-viral vector.

13. The vector of any of claims 1 to 11, wherein said vector is a viral vector.

14. The vector of any of claims 1 to 11, wherein said vector is a viral vector selected from the group consisting of adenovirus, adeno-associated virus, poliovirus, lentivirus, HSV, and murine Maloney-based virus.

15. The vector of any of claims 1 to 14, wherein said second promoter sequence is selected from the group consisting of U6 promoter, pol II promoter, H1 promoter, 7SK promoter and CMV promoter.

16. The vector of any of claims 1 to 15, wherein said first polynucleotide sequence encodes a polypeptide.

17. The vector of claim 16, wherein said polypeptide comprises a protein selected from the group consisting of an enzyme, cytokine, growth factor, hormone, receptor, and receptor ligand.

18. The vector of claim 1, wherein the target gene is endogenous to the intended host.

19. The vector of claim 1, wherein the target gene is exogenous to the intended host.

20. The vector of claim 1, wherein the target gene comprises viral RNA.

21. The vector of claim 1, wherein the target gene is a Dengue virus gene.

22. The vector of claim 21, wherein the Dengue virus gene encodes a structural protein.

23. The vector of claim 21, wherein the Dengue virus gene encodes a non-structural protein.

24. The vector of claim 1, wherein said second polynucleotide comprises at least one nucleic acid sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3, and SEQ ID NO:4.

25. A vector comprising at least one gene suppressing cassette, wherein said gene suppressing cassette comprises a polynucleotide operably-linked to a promoter sequence, wherein said polynucleotide encodes a short interfering RNA (siRNA) molecule that reduces expression of a target Dengue virus gene by RNA interference.

26. The vector of claim 24, wherein said vector comprises a plurality of gene suppressing cassettes.

27. The vector of claims 25 or 26, wherein said target gene encodes a structural protein.

28. The vector of claims 25 or 26, wherein said target gene encodes a non-structural protein.

29. The vector of claims 25 or 26, wherein said target gene is at least one gene encoding a protein selected from the group consisting of C, prM, E, NS1, NS2a, NS3, NS4a, NS4b, and NS5.

30. The vector of claims 25 or 26, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:3 or SEQ ID NO:4.

31. The vector of any of claims 25-31, wherein said vector is a viral vector.

32. The vector of claim 31, wherein the viral vector is adenovirus, adeno-associated virus.

33. The vector of any of claims 25-30, wherein said vector is a non-viral vector.

34. A method of modulating the expression of multiple genes within a host, said method comprising administering the vector of any of claims 1 to 24 to the host, wherein the first polynucleotide sequence is expressed in the host, wherein the second polynucleotide is transcribed to produce the siRNA molecule, and wherein the siRNA molecule is capable of reducing expression of a target gene within the host by RNA interference.

35. The method of claim 34, wherein the siRNA molecule is an RNA duplex comprising a sense region and an antisense region, wherein the antisense region comprises a plurality of contiguous nucleotides that are complementary to a messenger RNA sequence encoded by the target gene, and wherein the plurality of contiguous nucleotides hybridize to the messenger RNA sequence, thereby reducing expression of the target gene within the host.

36. The method of claims 34 or 35, wherein the target gene is an endogenous gene.

37. The method of claims 34 or 35, wherein the target gene is an exogenous gene.

38. The method of claim 37, wherein the exogenous gene is a viral gene or bacterial gene.

39. The method of claim 34, wherein the target gene is a viral gene comprising viral RNA.

40. The method of any of claims 34 to 39, wherein the host is a mammal.

41. The method of any of claims 34 to 40, wherein the host is a human.

42. A method for inhibiting the expression of Dengue virus genes within a host, said method comprising administering the vector of any of claims 25 to 33 to the host, wherein the polynucleotide sequence is transcribed to produce the siRNA molecule, and wherein the siRNA molecule is capable of reducing expression of a target Dengue virus gene within the host by RNA interference.

43. The method of claim 42, wherein the host is a mammal.

44. The method of claim 42, wherein the host is a human.

45. The method of claims 43 or 44, wherein the host is suffering from a Dengue virus infection.

46. The method of claims 43 or 44, wherein the host is not suffering from a Dengue virus infection, and wherein the vector is administered prophylactically.

47. A pharmaceutical composition comprising the vector of any of claims 1 to 33, and a pharmaceutically acceptable carrier.

48. A method for producing a vector for modulating the expression of multiple genes, said method comprising combining at least one gene promoting cassette with at least one gene suppressing cassette to form the vector of any of claims 1 to 24.

49. A method for producing a vector for inhibiting the expression of Dengue virus genes within a host, said method comprising combining at least one polynucleotide with an operably linked promoter sequence to form the vector of any of claims 25 to 33.